

PhD Thesis

**Modern Teaching Methods in
the Training of Basic Surgical Skills**



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Abbreviations used

COVID-19 = Coronavirus disease 2019

Ft = Forint

NPT = Near-Peer-Teaching

OSATS = Objective Structured Assessment of Technical Skills

UPMS = University of Pécs, Medical School

USD = United States Dollar

I. Introduction

Nowadays, Near-peer teaching (NPT) is gaining popularity as an effective teaching method in medicine, especially in anatomy and basic sciences. Simulation education can be defined as an educational method in which a given set of conditions is artificially created in order to study or experience something that is possible in real life.

I.2. Near-Peer Teaching

Near-peer-teaching (NPT) or demonstrator work is one of the most common forms of peer education. During the method, the person in the role of teacher attends the same training, but is at least one year ahead of the person being taught in their studies.

I.3. Distance education

On the one hand, the term distance education can be viewed as a teaching and learning environment where time and geography limit learning by not allowing face-to-face contact between student and instructor. On the other hand, distance education can be viewed as a method of education in which certain forms of education take place between two parties (student and teacher), are held at different times and/or places, and use different forms of educational materials.

I.4. Objectives

In the course of our NPT research, we assessed the effect of the technical application of NPT on the development and satisfaction of students using an objective method among homogenized groups. Main hypothesis: Involvement of NPT in surgical education improves the exam results of the students participating in the course.

Secondary hypothesis: Involvement of NPT in education improves the satisfaction of students participating in the course. The aim of the distance education research was to define the effectiveness of distance education in the teaching of basic surgical skills and comparing this to traditional hands-on teaching methods with a controlled study. The findings of this presented research work could potentially contribute to the emerging field of online and distance learning, which appears as a major challenge in the training of healthcare professionals, mainly in terms of hands-on trainings and practical skills.

II. Effectivity of Near-Peer Teaching in training of basic surgical skills

II.1. Population of study and methods

The current research's sample size calculation was based on the test results of previous years. The study sample estimate envisaged the involvement of 58 students, estimating a 3-point difference between the study and control groups ($\alpha = 0.05$, $\beta = 0.1$). Based on these, we included 60 volunteer students (30 women and 30 men, with a mean age of 22.6 ± 2.2 years) in the study. The criteria for student participation was the successful completion of the 'Basics of Surgery' course for the third-year pre-clinical curriculum of our university; however, the student should not complete the surgery summer practice after the fourth-year. So, participants were third- and fourth-year medical students. Three volunteer peer educators were also involved in the research. The NPT tutors were sixth-year medical students who had successfully completed the surgical subjects included in our university's compulsory curriculum, completed the simulation training centre's own NPT preparation course, and had a minimum of 3 semesters of NPT experience (NPT tutors); with these constraints, their knowledge is viewed to be reliable. The teaching staff consisted of three practicing clinical physicians working in the manual medical profession with at least 3 years of teaching experience (instructors).

Video recordings were evaluated with the involvement of three senior instructors who had a minimum of 10 years of teaching experience and 5 years of examination experience as clinical specialists working in the manual profession (senior instructors).

The study was approved by the Institutional Ethical Review Board (7719-PTE 2019).

II.2. Protocol including procedural details

Prior to the course, all students underwent a preliminary aptitude test. In doing so, we assessed their existing skills in surgical knotting techniques, basic suture techniques, and basic laparoscopic skills. Knotting and suturing exercises were recorded on video, which were evaluated anonymously by the three senior instructors. The average of the scores given by the instructors was the statistic used. Laparoscopic skills were scored based on an evaluation sheet issued by the simulator.

1. Based on the scores obtained, the participants were divided into 4 groups (from weakest to best) and then assigned a number to 1-6 within the group with the RAND.BETWEEN function. The students were divided into six randomized groups of 10, so that the average of the starting scores were almost equal (*Figure 1*).
2. A NPT tutor and instructor were assigned to the three groups by drawing lots (study group), and then an instructor was assigned to the remaining three groups by drawing lots (control group). Accordingly, each instructor had a group where a NPT tutor would help with their work and one where the instructor would keep the lesson alone.
3. All groups took a 20 x 45 minutes course with the similar timeline on different weekdays.
4. The skills of the students were assessed on the day after the end of the course in the same way as before the course.
5. At the end of the course, students completed a self-administered online anonymous questionnaire that measured their opinion about the course and the application of the NPT on a Likert scale of 5.

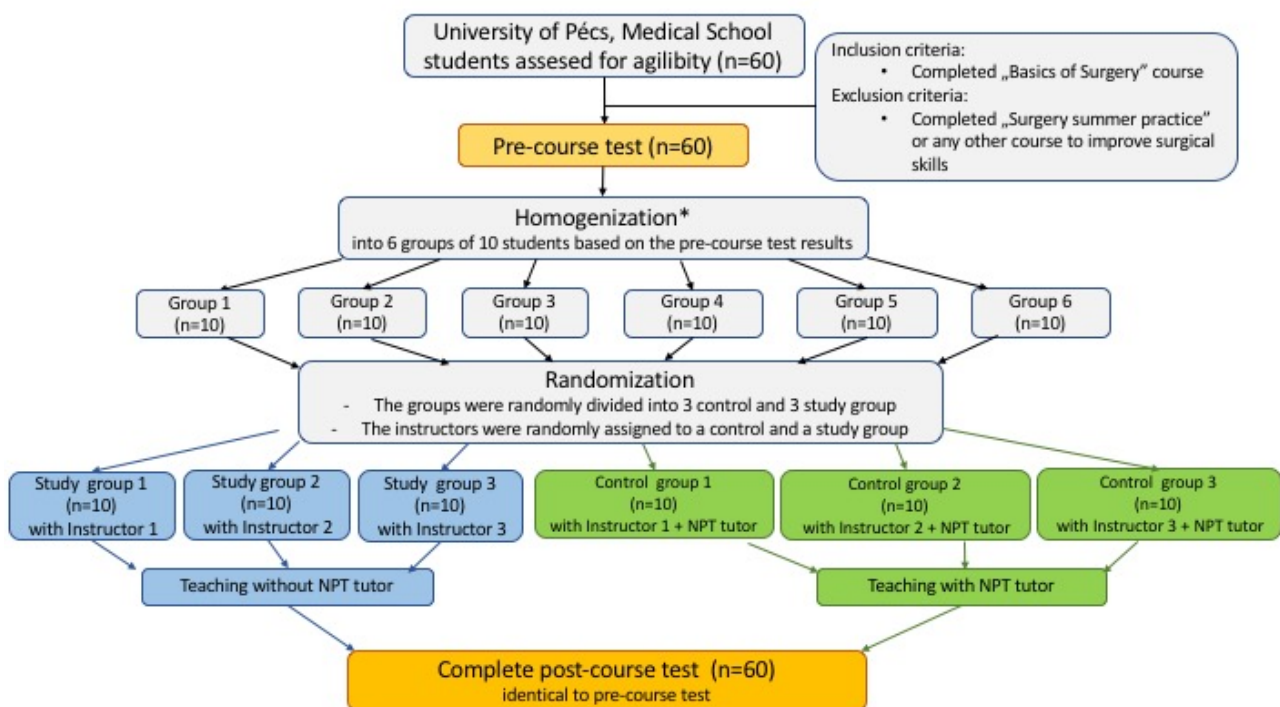


Figure 1. CONSORT diagram of the study population involvement and distribution.

* Homogenization: The students were ranked based on their pre-course results. Ten groups were created following the order of the student (6 students in each group), and a random number between 1 and 6 was assigned to each student in each group. This number determined the study group of the student. This resulted in the creation of 6 groups of 10 students with similar pre-course test result and distribution (1 student from the first, second... tenth decimal in each group).

II.3. Protocol of the evaluation

Surveys were conducted before and on the day after the course under the supervision of the instructors. Students completed the assignments independently, without assistance, which were videotaped so that the student's identity could not be identified (*Figure 2*).

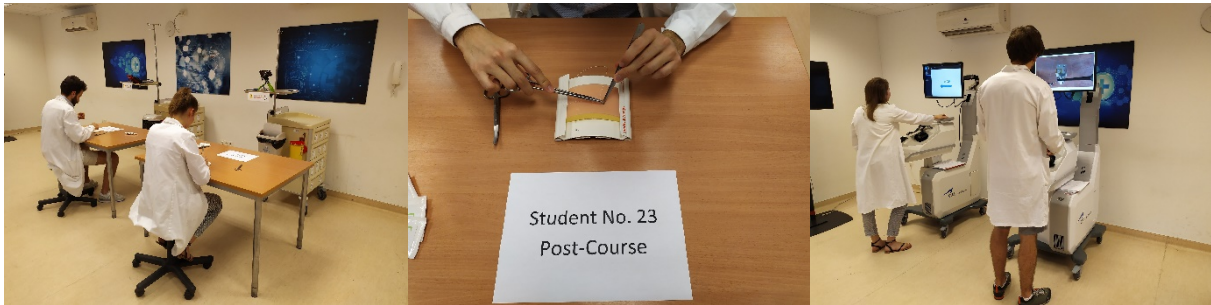


Figure 2. Post-course exam; left – recording of the suturing practices; middle – screenshot from the record; right – laparoscopic skills practices

Videos were evaluated by senior instructors based on the Objective Structured Assessment of Technical Skill (OSATS) after they were settled and randomly ordered. To evaluate knotting, a slightly modified version of the criteria published by Shen et al. Was used and as specialized criteria system to evaluate the sutures (*Table 1*) was developed. Prior to the course, test recordings with the help of the NPT tutors and instructors were taken to check the usability of the scorecard, and the evaluators learned how to use the method. Training was continued until the senior instructors received an α value above 0.95 in intraclass correlation studies. Skills to be acquired during the course:

1. Two-handed knot in the tension tissue model, with the latex rubber band of knotting trainer (three pieces with the right hand and three pieces with the left hand) evaluation according to OSATS,
2. One-handed knot in the torn fabric model, with the magnetic hook of knotting trainer (three pieces with the right hand and three pieces with the left hand) evaluation according to OSATS,
3. Simple interrupted suture, with atraumatic suturing material and instrumental knot with suture pad (three pieces) evaluation according to OSATS (*Table 1*),
4. Vertical mattress (Donati) suture, with atraumatic suturing material and instrumental knot with suture pad (three pieces) evaluation according to OSATS (*Table 1*),
5. Intracutaneous running suture, with atraumatic suturing material and instrumental knot with suture pad (4 cm) evaluation according to OSATS (*Table 1*), and

6. Performing a “Peg transfer-Level 1” task on a LapVR v4.0.399.46816 (CAE Healthcare, Sarasota, FL, USA) simulator (the better result of two attempts) evaluation based on the evaluation sheet issued by the tool.

	1	2	3
Hold the needle at 1/3	Not even once	Sometimes	Always
90° between the surface and the needle	Not even once	Sometimes	Always
Appropriate usage of forceps	Wrong	Intermediate	Excellent
Appropriate direction and technique of knotting	Wrong	Intermediate	Excellent
Appropriate tightness of the knot	Wrong	Intermediate	Excellent
Appropriate position the <i>skin edges</i>	Wrong	Intermediate	Excellent
Appropriate distance from the skin edge	Wrong	Intermediate	Excellent
Appropriate distance between sutures	Wrong	Intermediate	Excellent
Respect of tissue	Unnecessarily damaged the tissue	Handled the tissue carefully, but accidentally caused inadvertent damage	Did not damage the tissue
Time and motion	Did not finish within 4 minutes	Done in time, but a lot of unnecessary movements	Done in time, worked effectively
Maintenance of asepsis	Did not reach	Strived for it, but accidentally violated it	Reached

Table 1. Score system used for assessment of sutures

Statistical analysis was performed using the Mann-Whitney U Test and Wilcoxon signed-rank tests (IBM SPSS v23, IBM Corp., Armonk, NY, USA). The RANDBETWEEN function of Microsoft Excel v14.0.6112.5000 (Microsoft Corp., Redmond, WA, USA) was used for randomization. $P < 0.05$ was considered significant.

II.4. Results

The results of the pre-course test in the control groups without the NPT tutor (the overall results of the students were 120.406 points) did not differ significantly from the study groups that included the NPT tutor (119.320 points, $p = 0.679$).

Taking into account the overall results of the students, a significant improvement was achieved in all areas during the completion of the course (average 33.690 point improvement, $p < 0.001$) (Table 2).

	Pre-course	Post-course	Improvement	Wilcoxon (p)	Z
Overall results	119.863	153.553	33.690*	< 0.001	-6.736
Knotting	27.767	39.783	12.017*	< 0.001	-6.740
Two-handed knotting	13.583	19.333	5.750*	< 0.001	-6.724
One-handed knotting	14.183	20.450	6.267*	< 0.001	-6.514
Sutures	72.533	88.217	15.683*	< 0.001	-6.618
Simple interrupted	24.067	29.467	5.400*	< 0.001	-6.205
Vertical mattress (Donati)	24.667	29.517	4.850*	< 0.001	-5.799
Intracutaneous running	23.800	29.233	5.433*	< 0.001	-6.342
Laparoscopic basics	19.563	25.553	5.990*	< 0.001	-6.283

Table 2. Aggregate results of students' surgical skills pre- and post-course and the results of the Wilcoxon signed-rank test (*significant difference between pre- and post-course results)

In the groups where the NPT tutor assisted the teaching, students achieved a significantly greater improvement (30.180 vs. 37.200 point improvement, $p = 0.036$); however, this difference was significant only for the tasks related to knotting (9.300 vs. 14.733 point improvement, $p = 0.003$). There were no significant differences in tasks related to suturing (15.900 vs. 15.497 point improvement) and laparoscopic basics (4.980 vs. 7.000 point improvement) (Table 3).

	Control group	NPT group	Difference	Mann-Whitney (p)	Z
Overall results	30.180	37.200	7.020*	0.036	-2.100
Knotting	9.300	14.733	5.433*	0.003	-2.949
Two-handed knotting	4.600	6.900	2.300*	0.011	-2.536
One-handed knotting	4.700	7.833	3.133*	0.004	-2.849
Sutures	15.900	15.467	-0.433	0.865	-0.170
Simple interrupted	5.567	5.233	-0.333	0.789	-0.267
Vertical mattress (Donati)	4.433	5.267	0.833	0.528	-0.631
Intracutaneous running	5.900	4.967	-0.933	0.422	-0.802
Laparoscopic basics	4.980	7.000	2.020	0.156	-1.420

Table 3. The changes between the pre- and post-course tests of the control and study groups and results of the Mann-Whitney U test (*significant difference between the control and study groups)

Based on the feedback of students, although students positively assessed the presence of demonstrators (4.80 on a Likert scale of 5), this did not significantly affect their satisfaction (4.77 vs. 4.83, $p = 0.28$).

III. Effectiveness of distance learning in the training of basic surgical skills

III.1. Study population and methods

The initially envisioned sample size was estimated to be 58 persons. The average exam results from the previous 2 years were taken for basis, and three points difference was anticipated between the control and the study groups (alpha was set to 0.05, and beta to 0.1). In the end, 60 students were involved in the study (28 males, 32 females, average age: $22,8 \pm 3,4$ years). The students must have completed the 'Basics of Surgery' obligatory course for the third-year pre-clinical curriculum of our university to be involved; this course covers theoretical and manual fundamentals of surgery and operation techniques (e.g. structure of an operating room, basics of asepsis, physiology and pathology of wound healing, surgical instruments, basics of knotting, suturing and laparoscopy); however, the students should not have accomplished the surgery summer practice after the eighth semester. Therefore, participants were third- and fourth-year medical students. There were no other obligatory or facultative trainings to improve basic surgical skills, that the students could complete without the surgery summer practice. Accordingly, we believe the students had the same opportunity to practice and master the examined skills before our training.

Three practicing clinical physicians from a manual medical profession with a minimum of 3 years of teaching experience comprised the teaching staff (instructors). Every instructor taught a study and a control group. Three senior instructors with at least 10 years of teaching and 5 years of examination experience as clinical specialists working in a manual profession were involved to evaluate the exams (senior instructors). The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional and Regional Ethical Review Board of University (8443 – PTE 2020). Informed Consent Statement: Written informed consent was obtained from study participants. All participant agreed to take part in the study and approved to use their data for research purposes.

III.2. Study protocol

In order to perform the planned study, the following protocol was followed by the research group (*Figure 4*):

1. The students were ranked based on their pre-course results. Ten groups were created following the order of the student (6 students in each group), and a random number were assigned between 1 and 6 to each student in each group. This number determined the study group of the student, therefore we created 6 groups of 10 students with similar pre-course test result and distribution (1 student from the first, second... tenth decimal in each group).
2. The groups were randomly divided into 3 control and 3 study (distance learning) groups. The 3 instructors were randomly assigned to the groups, so each instructor had a study group and a control group.
3. All groups took a 20 x 45 minutes course with the same timeline.
4. The next day after the course the skills of the students were assessed in the same way as the pre-course test (*protocol of the exam see III.3.*).
5. The opinions of the students about the course and the application of distance education were collected after the course with a self-administered online anonymous questionnaire using a 5-point Likert scale (POTEcho v1.41, University of Pécs, Pécs, Hungary, was used for surveying).

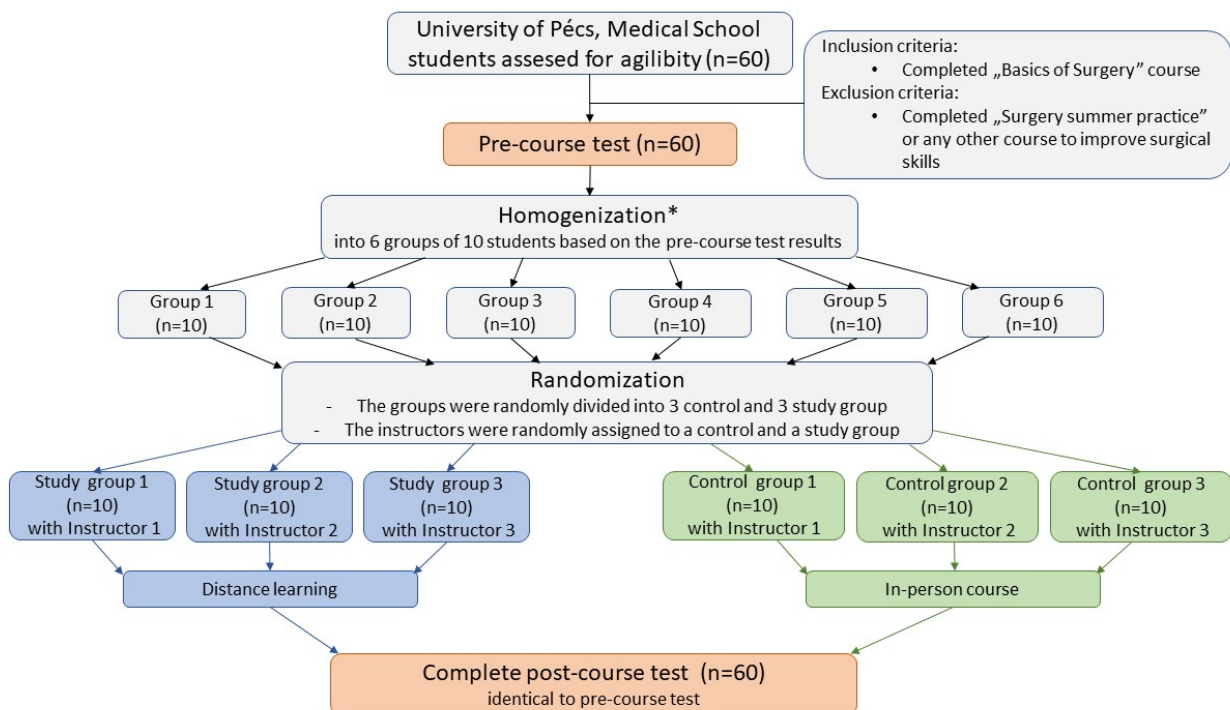


Figure 4. CONSORT diagram of the study population involvement and distribution

* Homogenization: The students were ranked based on their pre-course results. Ten groups were created following the order of the student (6 students in each group), and a random number between 1 and 6 was assigned to each student in each group. This number determined the study group of the student. This resulted in the creation of 6 groups of 10 students with similar pre-course test result and distribution (1 student from the first, second... tenth decimal in each group).

The distance learning groups took the classes 4 hours daily for 5 days on an online platform (Microsoft Office 365 Teams v. 4.7.19.0, Microsoft Corp., Redmond, WA, USA). For instructors and students, a SkillBox was provided which contained every tool that participants needed (Figure 2). During the video calls, the instructor presented exercises for the day and also played tutorial videos, while the students simultaneously practiced the exercise while they could ask about the movements, with the instructor constantly watching them on the screen.

The curriculum and timetable of the control group was identical to that of the study groups; classes were taught for 4 hours a day for 5 days. The same SkillBox set was used as in the study groups. The instructors played the same tutorial videos and demonstrated the moves of the exercise, after which the students tried to copy the movement patterns. The physical contact was allowed during the classes, although during the in-person education the relevant epidemiological regulations and preventive measures were strictly followed.



Figure 2. The contents of the SkillBox

A.) Atraumatic Monofilament, (2/0), B.) Monofilament (2/0) without needle, C.) Atraumatic Monofilament (3/0), D.) Atraumatic Monofilament (5/0), E.) Multifilament (2/0) without needle, F.) Knotting trainer (Original product of PTE 3D Printing and Visualization Center), G.) Wool for training of knotting, H.) Suturing pads and holder (Original product of PTE 3D Printing and Visualization Center), I.) Gloves, J.) Scalpel No. 22, K.) Scalpel Handle, L.) Hartmann MediSet (REF 478 119, LOT 000101134)

III.3. Protocol of the exam

The identical exam protocol was used for the pre- and post-course tests. The exams for the study and control groups also took place at the university and were video recorded.

Videos of the exams were randomly ordered and evaluated blindly by senior instructors based on OSATS (*see II.3*). A slightly modified version of the knotting assessment by Shen et al. and a self-developed criteria system for sutures were employed.

Tasks of the exam:

1. Two-handed knot in the tension tissue model (three right and three left),
2. One-handed knot in the torn fabric model (three right and three left),
3. Simple interrupted suture (three pieces),
4. Vertical mattress (Donati) suture (three pieces), and
5. Intracutaneous running suture (4 cm).

III.4. Statistical analysis

For randomization we have applied the RANDBETWEEN function of Microsoft Excel (v14.0.6112.5000 Microsoft Corp., Redmond, WA, USA). The data of the pre- and post-course tests were collected, and the grades of the 3 senior lecturers were averaged. Shapiro-Wilks test was performed to test normality. The results did not show normal distribution. To compare independent groups (the initial scores of the study and control group, and the improvement of the exam results in the study and control groups) Mann-Whitney U Test was used. Wilcoxon signed-rank test was performed to compare the pre- and post-course test results of the students. The results of students' feedback were exported from the POTEcho system to Microsoft Excel anonymously. As ordinal variables, the Mann-Whitney U Test was chosen to compare the answers of the study and control group. We have used IBM SPSS (v23, IBM Corp., Armonk, NY, USA) for statistical analysis and chart building. The level of significance was set to $P < 0.05$.

III.5. Results

III.5.1. Pre-course and exam results of study and control groups

The study compared the results of the students of distance learning to the results of those who participated in contact classes and evaluated the effectiveness of distance learning for basic surgical skills. The initial scores were almost equal on account of the homogenization. The starting knotting scores were significantly higher at the distance learning group and slightly lower in suturing, but this was not significant (*Table 4*).

	Study Group	Control Group	p	z
Overall pre-course points	98.600	100.100	0.304	-1.028
Knotting	31.567*	28.733*	0.031*	-2.153
Sutures	67.033	71.367	0.061	-1.872

Table 4. Initial scores of the study and control groups, Mann-Whitney U Test
(* significant difference between study and control group)

Taking into account the overall results of the students, a significant improvement was achieved in all areas during the completion of the course, which was analyzed by Wilcoxon signed rank test (*Table 5*). The results were similar if the results of the study group and the control group were studied separately.

	Pre-Course	Post-Course	p	Z
Overall results	99.350*	126.050*	<0.001*	-6.737
Knotting	30.150*	38.917*	<0.001*	-6.742
Sutures	69.200*	87.133*	<0.001*	-6.625

Table 5. Improvement in the exam results for all students, Wilcoxon signed rank test
(* significant difference between pre- and post- course)

Although there is a slightly greater improvement in the online course, it is not significant (online 28.200 vs. control 25.200, $p=0.198$). There was no significant difference in tasks related to knotting (study 8.233 vs. control 9.300, $p=0.317$). The difference was significant for the tasks related to sutures (study 19.967 vs. control 15.900, $p=0.043$), especially for Vertical mattress sutures (study 7.233 vs. 4.433, $p=0.005$) (*Table 6*). The gender of the students did not affect their development, nor did the person of the instructor.

Alteration	Online Group	Control Group	p	Z
Overall	28.200	25.200	0.198	-1.287
Knotting	8.233	9.300	0.317	-1.002
Two-handed knotting	3.800	4.600	0.304	-1.028
One-handed knotting	4.433	4.700	0.847	-0.193
Sutures	19.967*	15.900*	0.043*	-2.027
Simple interrupted	6.333	5.567	0.199	-1.285
Vertical mattress	7.233*	4.433*	0.005*	-2.824
Intracutaneous running	6.400	5.900	0.392	-0.855

Table 6. The improvement of the exam results in the study (online) and control groups, Mann-Whitney U test (*significant difference between study and control group)

III.5.2. Feedback of students

There was a significant difference only in terms of interest, which was significantly higher in the distance learning group. According to 93.34% of students, the quality of education did not deteriorate or did actually improve compared to contact classes. Also, 90% of them think that distance education is a better alternative and may replace traditional in-person classes (Figure 6).

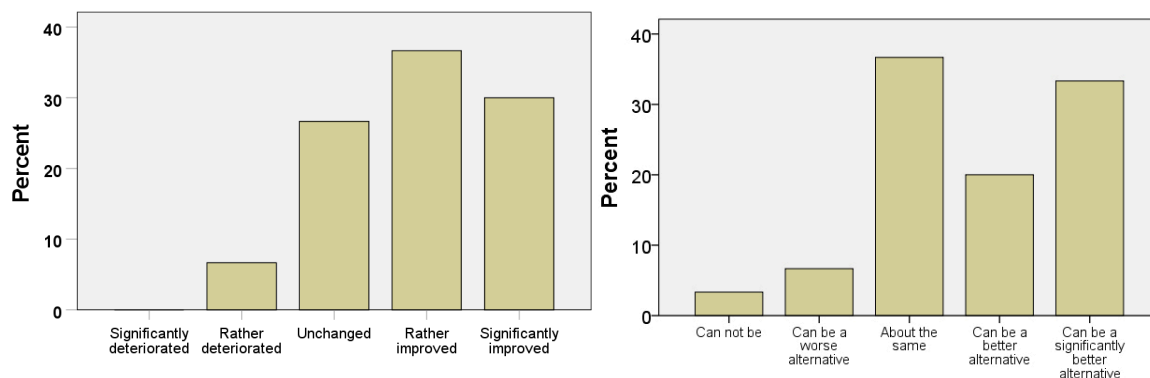


Figure 6. Histogram of the study group feedback questionnaire answers

- a.) Question: “In your opinion, how has the standard of teaching changed with the transition to distance education?”
- b.) Question: “In your opinion, could be the distance education serve as a proper alternative of the conventional”

III.5.3. Financial analysis

The content of a SkillBox is worth 128.70 USD. The delivery fee was an average of 11.33 USD per box. The wage of the instructors was 851.55 USD per group, with each group consisting of 10 students, accounting for 85.15 USD per student. There was an additional 20 USD payment for using personal resources in home offices. Altogether, the cost of the online course was 227.55 USD per student. This amount does not include the digital devices and infrastructure

necessary for distance education. There is no delivery fee and home office allowance in the case of a contact class, but the infrastructure and the staff of the university were used. The cost was calculated from the rental fee of the classroom, which was 478.00 USD per group, meaning that the cost of the contact course was 262.02 USD per student. The forint was converted to dollars at a fixed exchange rate on 01.03.2022. (1 USD=336,5 Ft).

IV. Conclusions and summary

Modern teaching methods can effectively promote education. Nowadays, NPT is one of the modern forms of education in medical universities, because through teaching, even the person who is in the role of an instructor deepens his knowledge. In this NPT research examining the effectiveness of peer education, in the case of the groups where an NPT tutor helped with the education, a significantly greater improvement was achieved in terms of the students' results, however, this difference was only prominent in the tasks related to knotting techniques that required high personalized attention - both in the case of the one-handed knot and two-handed knot. There was no significant difference in the acquisition of basic skills related to suturing and laparoscopic basics compared to the state before the course. Based on student feedback, students positively evaluated the presence of NPT tutors, but this did not significantly affect their overall satisfaction with the course. Based on the results of our research, the application of the NPT technique can be recommended for the teaching of basic surgical skills. The presence of a peer educator (NPT tutor) had a positive impact on student development. The preparation of medical doctors for patient-centered care requires that students actively integrate their knowledge and skills in order to provide precise, accurate and smooth patient care.

In summary, the development of basic surgical skills is essential in the life of future colleagues who choose a manual profession. Medical students must be prepared to be lifelong learners who can meet the challenges as a doctor in an ever-changing healthcare environment.

Distance education, as a possible alternative to classes that require in-person attendance, is very popular among students. When examining the effectiveness of distance education, the results of students participating in online education were compared with the results of those participating in traditional in-person classes, and then evaluated the effectiveness of online training of basic surgical skills. After the distance education, a slightly greater improvement was observed, but it was not significant. There was no significant difference in the tasks related to knotting, but a significant difference was observed in the tasks related to sutures,

emphasizing the high scores achieved in the case of vertical mattress sutures. Based on student feedback in terms of interest of the course, was significantly higher in the distance learning group. The results of the students improved similarly in both distance learning and traditional education. The online form of teaching was received positively among the students, as they found it an effective and good alternative. Based on our results distance learning can be as effective as traditional in-person classes in the field of basic surgical skills. In summary, the effective operation of distance learning requires greater self-awareness and responsibility from the student to process each part of the material almost independently. We believe that the pandemic has provided a huge boost to development, especially in the area of distance education, the benefit from which will still be apparent in a few years' time. This study compared traditional in-person teaching vs. teaching in a digital format, but it would certainly be interesting for the future research to compare different online teaching formats in terms of effectiveness in teaching practical skills.

IV.1 Summary of novel results and statements

1. It has been proven by objective methods (with a control group) that NPT is an effective teaching method for teaching basic surgical skills.
2. An objective evaluation system for surgical suturing in a simulation environment was created.
3. In the case of one-handed and two-handed knotting, a highly personalized attention is required to learn the appropriate right movements.
4. The presence of the NPT tutor does not affect the overall satisfaction of the students.
5. Distance education can be a possible alternative to the traditional in-person class when learning basic surgical skills.
6. In the case of the traditional contact class and the distance learning, the interest of the students was significantly higher in the online group.
7. During distance education, the results of the students improved significantly compared to the initial state.
8. Under certain conditions, distance learning can be a more cost-effective solution when teaching surgical skills compared to traditional contact classes.
9. According to the opinion of the majority of students, the quality of education during distance education did not change nor deteriorated compared to contact classes.

V. Publication related to thesis

Pintér Zs, Kardos D, Varga P, Kopjár E, Kovács A, Than P, Rendeki Sz, Czopf L, Füzési Zs, Schlégl ÁT. Effectivity of near-peer teaching in training of basic surgical skills – a randomized controlled trial. BMC Med Educ 2021; 21(1): 156. **IF: 2,463, SJR: 0,810 (Q1)**

Schlégl ÁT, **Pintér Zs**, Kovács A, Kopjár E, Varga P., Kardos DJ, Gasz B, Füzési Zs. Distance education for basic surgical skills using homemade tools – DIY methods in Response to COVID-19. Acad Med. 2020; 95(11):e7 – Letter to editor **IF: 6,893, SJR:2,273 (Q1, D1, 1/41 in Education, Scientific Disciplines)**

Pintér ZB, Maróti P, Kopjár E, Gasz B, Duga Z, Rendeki S, Nagy B, Füzési Z, Schlégl ÁT. Effectivity of Distance Learning in the Training of Basic Surgical Skills—A Randomized Controlled Trial. Sustainability. 2022; 14(8):4727. **IF: 3,251, SJR: 0,612, (Q1)**

Schlégl ÁT, **Pintér ZB**, Kovács A, Kopjár E, Varga P, Kardos D, Berner-Juhos K, Maróti P, Füzési Z. Distance Education for Basic Surgical Skills Using Homemade Tools—DIY Methods for Emergency Situations. Sustainability. 2022; 14(14):8639. **IF: 3,889, SJR: 0,664 (Q1)**

V.1. Presentation on international conference

Pintér, Zsolt Balázs, Füzési, Zsuzsanna, Schlégl, Ádám Tibor. A közeli kortársoktatás hatékonyságának vizsgálata alapvető sebészeti készségek oktatásakor. 10th Jubilee Interdisciplinary Doctoral Conference: Book of Abstracts. 347 p. pp. 72-72., 1 p. Pécs, Magyarország 2021. ISBN: 9789634298205

V.2. Presentation on Hungarian conference

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